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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/782,446	02/12/2001	Chok W. Ho	LAMIP152/P0692	9868

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EXAMINER
VINH, LAN

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 05/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

H6

Application No.	Applicant(s)
09/782,446	HO ET AL
Examiner	**Art Unit**
Lan Vinh	1765

Office Action Summary

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 March 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-11,13-16 and 20-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4-11,13-16 and 20-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 18
4. ☐ Interview Summary (PTO-413) Paper No(s).
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 4, 13,16 are rejected under 35 U.S.C. 102(e) as being anticipated by Ye et al (US 6,080, 529)

Ye discloses a method of etching patterned dielectric layer. This method comprises the steps of:

forming a hard mask layer 402 over the organic low k dielectric layer 404 (polyarylene) (col 21, lines 43-45)

forming/placing a patterned photoresist layer over the hard mask layer 402 (col 22, lines 1-3),

placing a substrate having an organic low k dielectric layer 404 (polyarylene) formed thereon in an etching chamber (col 21, lines 50-63)

using a plasma source gas of NH_3 inherently provided into the etching chamber while applying source power to the chamber to generate a plasma to etch the organic low k dielectric layer 404 (col 22, lines 39-42), the flow rate of NH_3 is 70 sccm (col 22, lines 42), which overlaps the claimed range of 5 sccm to 1500 sccm

etching the unpatterned photoresist in an NH_3 (hydrogen/nitrogen-based) plasma and Ye also discloses that hydrogen/nitrogen-based etch chemistry etches both photoresist and organic-based layer (col 12, lines 49-51; col 22, lines 38-42), which reads on simultaneously etching/stripping the photoresist layer during etching of the organic dielectric layer

Regarding claim 16, Ye discloses that the organic low k dielectric material 14 is made of polyarylene/ organic low k material (col 6, lines 25-2

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 5-7, 14-15 are rejected under 35 U.S.C.103(a) as being unpatentable over Ye et al (US 6,080,529) in view of Ding et al (US 5,814,563)

Ye method has been described above in paragraph 2. Unlike the instant claimed invention as per claims 5, 6, 14, Ye fails to disclose providing CH_3F gas (flow rate between 1 sccm –50 sccm) while providing NH_3 into the chamber to etch the dielectric layer.

However, Ding, in a method for etching dielectric layer using fluorocarbons, teaches flowing CH_3F gas (flow rate between 5 sccm-20 sccm) and NH_3 gas into the chamber to etch the dielectric layer (col 10, lines 26-27)

Hence, one skilled in the art would have found it obvious to modify Ye's step of etching the dielectric layer by using an etching mixture of CH_3F gas and NH_3 to etch the dielectric layer as per Ding because Ding teaches that it has been discovered that fluorohydrocarbons gas in combination with NH_3-generation gas provides unexpected and surprising results such as providing increased dielectric etch rate (col 6, lines 14-18)

Regarding claims 7, 15, Ye discloses performing an etch with CF_4 gas to etch the hard mask layer before etching the dielectric layer 404 (col 22, lines 1-5)

5. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et al (US 6,080,529) in view of Ding et al (US 5,814,563) and further in view of Ikegami (US 6,355,572)

Ye as modified by Ding has been described above in paragraph 4. Unlike the instant claimed inventions as per claims 8, 9, Ye and Ding fail to disclose using C_4F_8 gas and oxygen gas in addition with the etchant gas comprising CF_4

However, Ikegami discloses a method for dry etching an organic SOG/low-k dielectric film comprises the step of etching a dielectric layer using C_4F_8 +O_2 in addition to CF_4 etchant (col 3, lines 36-46)

Hence, one skilled in the art would have found it obvious to modify Ye and Ding by adding C_4F_8 +O_2 gaseous mixture to the CF_4 etchant as per Ikegami because Ikegami states that the addition of oxygen is considered to be a phenomenon peculiar to the organic dielectric layer and indicates that the oxygen gas other than the C_4F_8 gas is useful as etching species of the organic dielectric film (col 4, lines 47-50)

Regarding claim 10, Ye as modified by Ding and Ikegami discloses the invention except for the specific flow rate of oxygen. However, one skilled in the art would have found it obvious to adjust the flow rate of oxygen in Ye's modified method to obtain any specific value since it has been held that discovering an optimum value of a variable is within the purview of routine experimentation by the person of ordinary skill in the art . In re Boesch, 617 F2d 272, 276, 205 USPQ 215, 219 (CCPA 1980)

The limitation of claim 11 has been discussed above in paragraph 10.

6. Claims 20-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et al (US 6,080,529) in view of Guinn et al (US 5,877,032)

Ye discloses a method of etching patterned dielectric layer. This method comprises the steps of:

placing a substrate having an organic low k dielectric layer 404 (polyarylene) formed thereon in an etching chamber (col 21, lines 50-63)

provided an etchant gas of NH_3 into the etching chamber, the flow rate of NH_3 is 70 sccm (col 22, lines 42)

using a plasma source gas of NH_3 provided into the etching chamber while applying source power to the chamber to generate a plasma to etch the organic low k dielectric layer 404 (col 22, lines 39-42)

maintaining the substrate support platen/holder at a temperature of 5^0 C during the etching of the layer 404, providing power source of about 1800 W (col 22, lines 41-43)

Unlike the instant claimed invention as per claims 20-24, Ye fails to disclose the specific values of the flow rate of NH_3, the temperature of the substrate holder and the power input/source

However, Guinn, in a process for plasma etch, teaches that plasma etch processing parameters such as temperature, flow rate, source power are selected for variation to change the etch rate (col 4, lines 1-6)

Hence, one skilled in the art would have found it obvious to vary/adjust Ye's NH_3 flow rate, substrate temperature and power source to obtain the optimum values by conducting routine experimentation in view of Guinn's teaching in order to achieve a desired etch rate.

Response to Arguments

7. Applicant's arguments filed 3/4/2003 have been fully considered but they are not persuasive.

The argument that the examiner fails to point out anything in Ye that discloses simultaneously stripping the photoresist during the etching of the organic dielectric layer is unpersuasive because in paragraph 2 of this office action, the examiner refers to col

12, lines 49-51; col 22, lines 38-42 of Ye wherein Ye discloses the step of etching the unpatterned photoresist in an NH_3 (hydrogen/nitrogen-based) plasma and Ye also discloses that hydrogen/nitrogen-based etch chemistry etches both photoresist and organic-based layer which, as interpreted by the examiner, reads on simultaneously etching/stripping the photoresist layer during etching of the organic dielectric layer. Thus the examiner asserts that claims 4 and 13 are anticipated by Ye in this regard.

Applicants further argue that it would not be obvious to combine the etch chemistry of Ding with the process of Ye to selectively etch an organic dielectric layer with respect to the hardmask. This argument does not commensurate with the scope of claim 5 because claim 5 does not require selectively etch an organic dielectric layer with respect to the hardmask.

In response to applicant's argument that there is no suggestion to combine the references of Ye and Ding because Ding fails to teach his etch chemistry etches the organic dielectric layer, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since both Ye and Ding are concerned with method of etching a dielectric layer and Dinh teaches that his etch chemistry provides excellent dielectric etch, one skilled in the

art would have found it obvious to employ Dinh etch chemistry in Ye method to produce the claimed invention.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.

BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

LV
May 16, 2003